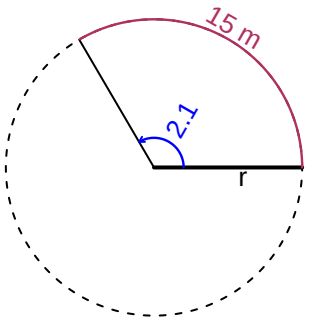
Name: Date:

Trig Final (SLTN v671)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 15 meters. The angle measure is 2.1 radians. How long is the radius in meters?

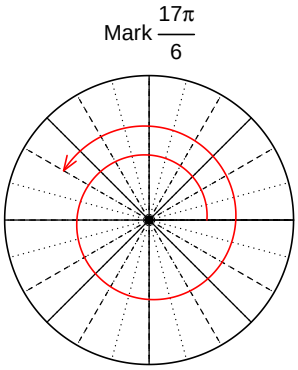


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

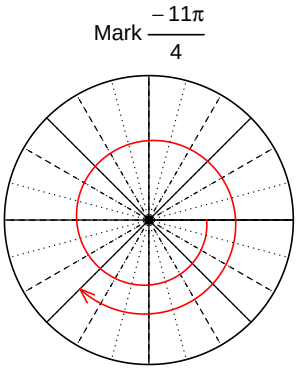
$r = 7.143$ meters.

Question 2

Consider angles $\frac{17\pi}{6}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{17\pi}{6}\right)$ and $\sin\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(17\pi/6)$



Find $\sin(-11\pi/4)$

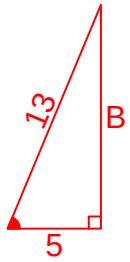
$\cos(17\pi/6) = \frac{-\sqrt{3}}{2}$

$\sin(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{5}{13}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

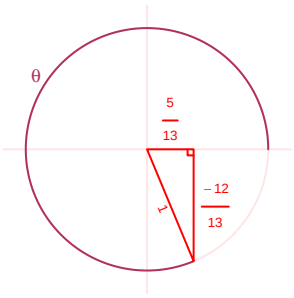
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$5^2 + B^2 = 13^2$$
$$B = \sqrt{13^2 - 5^2}$$
$$B = 12$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-12}{13}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 5.19 meters, a frequency of 3.38 Hz, and a midline at $y = -6.8$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -5.19\sin(2\pi 3.38t) - 6.8$$

or

$$y = -5.19\sin(6.76\pi t) - 6.8$$

or

$$y = -5.19\sin(21.24t) - 6.8$$